



**ENGINEERING OPERATIONS COMMITTEE
MEETING MINUTES
OCTOBER 10, 2000 - 9:00 A.M.
EXECUTIVE CONFERENCE ROOM**

Present:	C. T. Maki	G. D. Taylor	J. D. Culp
	C. Roberts	J. D. O'Doherty	T. E. Davies
	J. W. Reincke	T. Fudaly	S. Bower
Guests:	J. T. LaVoy	T. Myers	M. Frankhouse
	D. L. Smiley	G. Mayes	J. Ruszkowski
	G. Etelamaki		

OLD BUSINESS

1. Approval of the Minutes of the September 6, 2000, Meeting - C. T. Maki

Minutes of the September 6, 2000, meeting were approved as written.

NEW BUSINESS

1. Research Report, *Investigation of Prestressed Box Beam Plaza Structures Z01, Z02, and Z03 of 63102 Over I-696 in Southfield, Michigan* - J. W. Reincke/R. D. Till

The report summarizes the plaza bridges' problems found in the original design and construction. It delineates the corrective actions taken to rehabilitate the three structures. The research investigation included load testing the salvaged beams. The technical investigation determined the cause of the beam cracks and substantiated the structural integrity of the structures before and after rehabilitation.

Work on the plaza bridges is now complete and the recommendation is to publish and distribute the final report.

ACTION: The committee approved the report and authorized its distribution.

2. Research Report, *Evaluation of Various Pavement Sealants* - D. L. Smiley

In 1992, EOC placed a moratorium on the use of silicone joint sealant after unacceptable performance on several concrete pavement projects. After inconclusive laboratory results, a field trial on I-94 westbound near Hartford was initiated. It was done under a mutual agreement with the materials' suppliers to judge the actual field performance of silicone sealants and compare them to neoprene sealants.

The research report recommends that the moratorium on silicone sealants be made permanent for new or reconstructed concrete pavement.

The Pavement Committee has reviewed the report and concurs with the recommendation.

ACTION: The recommendation to continue a permanent moratorium is supported. The research report is approved for publication and distribution.

3. **Pavement Committee Minutes - S. Bower**

The minutes of the Pavement Committee for their May, July, August, and September 2000 meetings were reviewed. The future distribution of these minutes will be made along with the minutes of the EOC meetings.

ACTION: Four sets of Pavement Committee minutes are attached for distribution.

4. **Approval of 2001 HMA Projects That use Sampling From Behind the Paver for Acceptance - M. Frankhouse**

Sampling behind the paver was first used in the 1998/99 construction season to gather informational data. During the 2000 construction season, ten projects included this type of sampling in the contract. The results are very conclusive. Our experience to date is successful as measured by the following points:

- There were a limited number of projects with mixture failures or premature distress.
- The procedures identified out-of-specification mixture properties on certain projects that were not identified by truck samples.
- Contractors modified their plant operations when test results showed changes were necessary to meet specifications.
- Field staff supports this type of sampling.

It is recommended that the department expand the use of sampling from behind the paver to 25 projects for the 2001 construction season.

ACTION: EOC approves the recommendation and Tom Maki suggested that the regions decide how many projects they want to implement in 2001.

5. **Establish Research Centers of Excellence - Structures Focus Area - J. W. Reincke**

The department has significantly expanded its bridge program to around \$180 million per year. Research must now expand its efforts to meet the strategic needs of the program. Research worked with area experts to identify the five year research needs in order to improve the safety and durability of structures and bridges on the system.

A request for qualifications to establish a research center of excellence in this focus area resulted in two separate, joint venture proposals from the universities.

- It is proposed to establish a Structural Durability Research Center of Excellence as a cooperative partnership between MTU and WSU.
- It is proposed to establish a Bridge and Structures Research Center of Excellence as a cooperative partnership between MSU and U of M.

It was further recommended that an SPR funding or alternative funding level of \$250,000 per year be approved for both centers.

ACTION: The establishment of the two centers of excellence is approved. Funding will use the State Planning and Research Program funds to the extent possible. Any balance of funds will come from other sources.

6. **Bituminous Mixture Selection Guidelines - M. Frankhouse**

The issue about Superpave for CPM projects is tabled until the November meeting. The updates to the guidelines are approved except for the proposed guide changes to the CPM program. An updated guidelines will be issued immediately that includes the existing CPM mixture guidelines.

7. **Sign Leasing Proposal - T. Maki**

The department is investigating a pilot program to lease trunkline signs on a corridor from the private sector. This is being tried in three municipalities in other states. A team will be established to determine potential benefits and to develop details. Tom Myers will follow up on this idea. Bids would be required to initiate a sign leasing program before it goes under contract. There may be other areas in which this concept could be applied, such as pavement markings.

8. **Pavement Selection - C. Bleech**

A. **M-50 (Monroe County): CS 58042, JN 45642, Reconstruct Westwood to US-24**

The reconstruction alternates considered were Alternate 1, a flexible bituminous pavement, and Alternate 2, a jointed reinforced concrete pavement.

A life cycle cost analysis (LCAA) was performed and Alternate 1 was approved based on having the lowest Equivalent Uniform Annual Cost. The pavement design and cost analysis summary for Alternate 1 are as follows:

38mm	Bituminous Mix 5E3, Top Course (Mainline)
50mm	Bituminous Mix 4E3, Leveling Course (Mainline)
76mm	Bituminous Mix 3E3, Base Course (Mainline)
160mm	Aggregate Base
460mm	Sand Subbase
150mm	Subbase Underdrains
784mm	Total Thickness
Present Value Initial Construction Costs	\$468,991/kilometer
Present Value Initial User Costs	\$49,174/kilometer
Present Value Maintenance Costs	\$112,736/kilometer
Equivalent Uniform Annual Cost	\$40,339/kilometer

B. M-50: CS 58042, JN 50711, Rehabilitate West of Raisinville to Westbound

The rehabilitation alternates considered were Alternate 1, a rubblizing and bituminous overlay, and Alternate 2, an unbonded jointed plain concrete overlay.

An LCAA was performed and Alternate 1 was approved based on having the lowest Equivalent Uniform Annual Cost. The pavement design and cost analysis summary for Alternate 1 are as follows:

38mm	Bituminous Mix 5E3, Top Course (Mainline and Inside Shoulder)	
50mm	Bituminous Mix 4E3, Leveling Course (Mainline and Inside Shoulder)	
76mm	Bituminous Mix 3E3, Base Course (Mainline and Inside Shoulder)	
164mm	Bituminous Mix 4C and 3C (Outside Shoulder)	
203mm	Rubblized Concrete Pavement	
381mm	Existing Base/Subbase	
	Underdrains	
748mm	Total Thickness	
Present Value Initial Construction Costs		\$159,460/dir-km
Present Value Initial User Costs		\$38,099/dir-km
Present Value Maintenance Costs		\$47,979/dir-km
Equivalent Uniform Annual Cost		\$16,856/kilometer

These projects were approved in September pending industry review, which is now complete.

NOTE: The pavement selection approval process will now include a two week period for industry review of the pavement selection process following EOC approval.

(Signed Copy on File at C&T/Secondary)
 Jon W. Reincke, Secretary
 Engineering Operations Committee

JWR:kat

Attachments

cc: EOC Members
 Region Engineers

J. R. DeSana	R. J. Risser, Jr. (MCPA)	L. Stornant	T. L. Nelson
R. J. Lippert, Jr.	A. C. Milo (MRBA)	J. Ruskowski	R. D. Till
D. L. Smiley	J. Becsey (MAPA)	C. Libiran	M. Frierson
M. Nystrom (AUC)	D. Hollingsworth (MCA)	G. J. Bukoski	C. W. Whiteside
M. Newman (MAA)	J. Steele (FHWA)	K. Rothwell	T. E. Myers
J. Murner (MRPA)			

Pavement Committee
May 30, 2000 Meeting
Construction & Technology Laboratory

Attending:

Steve Bower - Chair	Wayne Schoonover
Dave Smiley - Secretary	Rich Ostrowski
Mike Frankhouse	Paul Steinman
John LaVoy	Robert Ranck, Jr.
Larry Galehouse	Ryan Rizzo - FHWA

OLD BUSINESS

No items

NEW BUSINESS

00-01P Committee Organization

Steve explained the purpose and function of this newly formed EOC sub-committee (see EOC meeting of Jan.6, 2000). The Pavement Committee represents EOC on technical matters regarding overall pavement operations, including their related materials, design, construction, and maintenance.

Organizational decisions were made as follows:

1. Dave Smiley was appointed secretary
2. Initially, meetings will be held monthly on the second Tuesday following the week EOC meets. The next four meeting dates through October were established. Besides Lansing, committee meetings will be held in the Regions to coincide with field construction reviews.
3. Recommend that meeting minutes be drafted and then reviewed for approval at the next meeting. They will be submitted to EOC and distributed with the usual EOC mailing.

#00-02P Special Provision for Cold-in-Place Recycling

A draft SP and proposed guidelines for use were discussed. A similar treatment has been used by the department in the past (see 4.07 of 1990 Std. Specs.). It is being reintroduced, because its major deficiencies have been improved upon. Ontario has successfully used the treatment extensively. The treatment is an alternative to crush and shape for flexible pavements or with mill and fill treatments for composite pavements. It is not for use in the CPM program. The committee will finalize the SP and guidelines at the July meeting.

#00-03P Protocols for Field Testing

Larry explained the need for a process to document the use of “new” treatments or materials in field trials for the department’s Preservation Program, specifically new (emerging technologies) CPM treatments. AASHTO has developed a protocol for this purpose which the EOC approved for department adoption at its Jan. 6, 2000 meeting. The committee supports this effort.

Tentative general format steps for documenting will include:

1. Develop a guideline for use - action >Lansing CPM coordinator
2. Prepare a work plan that explains need and likely benefits which is typically authored by the using Region with appropriate Lansing staff assistance
3. Committee reviews draft work plan for statewide conformity and application
4. Construction oversight and post-evaluation performed jointly by Region/TSC and Lansing pavement/materials staff

#00-04C/D Emerging CPM Technologies

Larry solicited comments from the committee regarding new emerging technologies being proposed for use in the CPM program. The Regions will be notified of the need to document and monitor their use by protocol (item #00-03). Funding will come from the Region's discretionary CPM budget.

#00-05D Jointed Plain Concrete Pavement (JPCP)

Steve gave a status report on the recent department discussions on the use and condition reporting of JPCP. This is a current discussion item with EOC. No action by the committee is required.

#00-06P Review of Research Reports

A committee function is to review the findings of department pavement/material research studies to determine their feasibility for implementation. Several possibilities for conducting such a review were discussed. The details the committee needs to review will vary by project, but will likely include the project executive summary, findings with any implementation recommendations, and a possible briefing presentation by the project manager. A recent study on bituminous segregation will be reviewed at the July meeting.

#00-07D M-39 Demonstration Project

Steve gave a progress report on the pavement selection/design for the M-39 (Southfield Freeway) demonstration project. This is a current discussion item with EOC. No action by the committee is required.

Notes:

C = work on item is completed

P = item is still pending additional committee action

D= discussion/information item

DLS: C&T

Approved at July 11, 2000 meeting

Pavement Committee
July 11, 2000 Meeting
Maintenance Division

Members:

Steve Bower - Chair (a)	Wayne Schoonover
Dave Smiley - Secretary	Rich Ostrowski
Mike Frankhouse	Paul Steinman
John LaVoy	Robert Ranck, Jr.(a)
Larry Galehouse	Ryan Rizzo - FHWA

(a) = absent

Note: In the absence of the chair, the committee secretary chaired the meeting. Wayne Schoonover announced that this would be his last committee meeting. Wayne was thanked for his service both on this committee and his years of service on the Bituminous Advisory Committee.

OLD BUSINESS

#00-02C Special Provision for Cold-in-Place Recycling

The committee approved the draft special provision. It will be submitted to the Engineer of Specifications for review and approval. The accompanying treatment guidelines were also discussed. The secretary will assure Steve has made the corrections recommended at the May meeting. Several upcoming projects were mentioned where the special provision is likely to be used in future program years.

#00-05D Jointed Plain Concrete Pavement (JPCP)

The committee was briefed on the current status of using JPCP designs. JPCP designs will be considered on a project by project basis, as was approved by EOC at their June meeting. Dave informed the committee about the investigative study that has initiated to determine the causes of early cracking on some recent projects in southern Michigan. The committee was also briefed on the status of using the special provision for P1-modified concrete mixtures in conjunction with JPCP designs.

#00-06P Review of Research Reports

The committee decided to have additional meetings scheduled as needed during the year to exclusively review the results of completed research studies. The first meeting is scheduled for September 7, 2000 at 1:00 p.m. at C&T.

NEW BUSINESS

#00-08C/D Affects of One Course Overlays on Ride Quality

Rich discussed a current project on M-102 (8-mile) that consisted of extensive Det. 7 & 8 repairs with a one course (63.5 mm) overlay (4E-30 mixture). The project scope was changed from a two course overlay late in the design process. The ride quality on the project has not been

approved because the 63.5 mm overlay is insufficient to cover the 7 & 8 repairs, which have deformed (humped) the overlay at many locations. Rich encouraged committee members to spread the word to avoid this type of work if improvements in ride quality are expected. The project had no specification for improving ride quality, but it was mentioned the department's ride quality committee is addressing the need for ride quality improvement with one course overlays.

#00-09D Average CPM Unit Prices

Larry Galehouse provided the committee with average bid (low) unit prices for typical CPM treatments for the 2000 program:

<u>Treatment</u>	<u>Unit Price</u>
Mill/Fill	\$3.27/m ²
Single Chip Seal	\$0.99/m ²
Double Chip Seal	\$2.06/m ²
Microsurface	\$2.12/m ²
Paver Placed Seal	\$3.75,3.79,4.33/m ² (low bids of 3 projects)

#00-10D Administration of Warranty Projects

Rich led a discussion regarding the need to develop statewide uniformity as to how warranty projects are administered during the warranty period. Rich has been asked to initiate a policy for the Metro Region. Several issues were discussed. They included; (1) the need for statewide uniformity in enforcement and interpretation of the warranty requirements, (2) a method to remove objectionable contractors from the bidding process, (3) timely action by Regions/TSC's regarding project acceptance and condition monitoring.

Some possible resolutions were discussed; (1) Develop guidelines to clarify basis for warranty requirements and their enforcement and monitoring, (2) modify the pre-qualification process to disallow objectionable contractors from bidding on warranty projects, (3) extend the evaluation review period to include the warranty period, (4) develop a method to reward a contractor who willingly performs their responsibility.

#00-11C Research Report - "Detecting and Quantifying Segregation in Bituminous Pavements and Relating its Effect to Condition"

Mike Frankhouse provided the committee with a summary of the findings from the research which was recently conducted by MSU. The project objective was to qualify a means to correct segregation as it occurs during paving by the use of nuclear density testing. The study found that statistically significant differences occurred with nuclear density readings when medium to heavy segregation was present. The study also determine that pavement condition declines much more rapidly when segregation is present. Raveling and cracking were most affected with their growth rates dependent on the degree of segregation.

As a result of the project, the Segregation sub-committee has drafted a specification for controlling uniformity in bituminous mixtures during placement. The committee was asked to review the draft version and provide comments to Mike. The committee agreed that the study results were valuable and that the most appropriate implementation action has been taken.

Notes:

C = work on item is completed

P = item is still pending additional committee action

D= discussion/information item

DLS: C&T

approved 8-8-00

Pavement Committee
August 8, 2000 Meeting
Macomb TSC

Attending:

Steve Bower - Chair
Mike Frankhouse
John LaVoy
Larry Galehouse

Dave Smiley - Secretary
Paul Steinman (a)
Robert Ranck, Jr.
Ryan Rizzo - FHWA

Rich Ostrowski

(a) = absent

About twenty guests from the Metro Region attended portions of the meeting

OLD BUSINESS

The July committee notes were approved without changes.

#00-02C Special Provision for Cold-in-Place Recycling

The item special provision and guidelines for use were presented to EOC at their July meeting. EOC approval will be required for each project. The sponsoring Region should provide a representative at the meeting.

#00-05D Jointed Plain Concrete Pavement (JPCP)

FHWA has formed a national advisory committee to develop guidelines for designing and constructing JPCP to reduce the occurrence of early cracking. Dave Smiley represented the department at the first committee meeting in Madison, Wisconsin. WisDOT is experiencing early cracking on portions of I-90 north of Madison. WisDOT pavement designs for JPCP are similar to the department's. Their forensic investigation, which is underway, should provide insight for our own state investigation as to causes of early cracking on some Michigan routes constructed during the past five years (see July 11th minutes).

00-01P Committee Organization

Steve explained the purpose and function of this newly formed EOC sub-committee (see EOC meeting of Jan.6, 2000) to the attendees. The Pavement Committee represents EOC on technical matters regarding overall pavement operations, including their related materials, design, construction, and maintenance.

NEW BUSINESS

#00-12D Bituminous Mixture Selection Guidelines

The revised guidelines, dated July 31, 2000, were reviewed by the committee. New additions are: (1) Binder type (w/polymer notation) is shown with mixture type, (2) SuperPave mixtures are allowed for use in CPM program, (3) Requirements for AWI included.

Some portions of the guidelines were unclear. Mike Frankhouse will make modifications to clarify the intent and present them for review and approval at the September EOC meeting.

#00-13C M-46 Bituminous Overlay with Distress Relieving Membrane (DRM)

The committee reviewed and approved a request from Bay Region to use a DRM seal in conjunction with a bituminous overlay on M-46 (CS 29042) between Merrill and St. Louis. The DRM is intended to further reduce the tendency for reflective cracking. It consists of a emulsified membrane with a “large” aggregate cover. The region will develop a monitoring plan to document the fix’s performance and cost effectiveness with other treatments.

#00-14D Dowel Bar Retrofit (DBR) Projects

Rich Ostrowski led a lengthy discussion on the department’s experience with DBR projects, especially in the Metro Region on I-69, I-696, and M-10. In 1999 about 3300 DBR’s were placed on EB I-69 in St. Clair County. Approximately 4.7% of the installations in the right lane and 0.5% in the left lane have failed. DBR’s on I-696 and M-10 are being installed this year. The committee agreed that more specific guidelines for proper selection of cracks suitable for DBR’s are needed. Those guidelines and additional ones regarding inspection and a post-construction condition rating method will be developed before the next construction season.

#00-15D Expansion Joints in JPCP

The Michigan Concrete Paving Association (MCPA) has proposed that by eliminating regular expansion joints in JPCP pavements, performance can be improved at a reduced initial cost. MCPA references documentation by ACPA that states expansion joints are not needed for pavements with short joint spacing (< 60') when paving occurs above 40°F. Expansion is still required at fixed points, like bridges, and at PT’s and PC’s. The ACPA literature claims any additional joints will close over time which loosens adjacent contraction seals and reduces load transfer efficiency.

The need issue is being debated on the US-131 unbonded overlay north of Grand Rapids which was recently bid and awarded to Ajax Paving Industries, Inc. Discussion on the issue relative to department standards will continue with MCPA at regular partnering sessions.

General Discussion

Discussion items were solicited from guest attendees. Interest in performance of shallow depth spall repairs and warranties was expressed. Shallow depth repairs are being tried on several Metro Region routes with much varying performance. Successful performance is highly dependent on selection of an appropriate spall for repair and it’s preparation. The backfill material must also be compatible with the parent concrete. Again guidelines on proper usage are needed. The item will be discussed this fall at an industry sponsored training session on CPR techniques.

Discussion on warranties focused on the need for review and monitoring after construction. The effort involved is greatly exacerbated by the large number of existing warranty projects, plus the likely accelerated use for future projects. Metro is considering several options to properly manage their projects.

Notes:

C = work on item is completed

P = item is still pending additional committee action

D= discussion/information item

DLS: C&T

Approved 9-12-00

PAVEMENT COMMITTEE
September 7, 2000
Construction & Technology Division
Special Meeting - Review Research Reports

Attending

Dave Smiley
Larry Galehouse
Mike Frankhouse
Paul Steinman
Ryan Rizzo

The Committee met to review the final reports for the following research projects. The committee's objective was to decide on any implementation action based on the report's recommendations. The MDOT project manager attended the meeting to provide a project summary for committee members.

Title - "Factors Affecting Shear Capacity of Transverse Cracks in Jointed Concrete Pavement (JCP)"

MDOT Project Manager - John Staton C&T
Contract Principal Investigator - Michigan State University

Abstract:

The purpose of the project was to evaluate the factors effecting the actual field performance (load transfer) of transverse cracks in JCP. The study followed an extensive laboratory study by MSU regarding the load transfer capability of full-size, cast-in-place slabs, where differing coarse aggregates, reinforcement, and support conditions were evaluated. This study analyzed crack surface texture, deflection values, concrete materials, crack characteristics, and pavement mechanical properties. The study also evaluated additional laboratory cast slabs similar to those used in the previous MSU project.

Recommendations:

The study verified that many recent department design changes, including widen lanes, joint spacing, aggregate specifications, and shoulder designs have been appropriate to extend pavement life. Threshold limits for load transfer efficiencies were provided to determine when crack rehabilitation is most beneficial. A project deliverable was suppose to be a supporting work plan for the department's Preventive Maintenance Program. The work plan was to utilize findings from this project to enhance current rehabilitation methods for dealing with cracks in concrete pavements. The findings were insufficient for this purpose.

Action:

No specific action regarding implementation is required. The study only confirmed current department standards and procedures for the design and construction of concrete pavements are appropriate. However, it strongly supports the department's initiative toward achieving improved

performance by the use of modifications to our P1 concrete concrete mixtures, plus the inclusion of more prudent construction practices for hot weather paving.

Title - “Evaluation of Various Joint Sealants”

MDOT Project Manager - Mike Eacker C&T

Abstract:

The purpose of the project was to compare the field performance of silicone and polyurethane sealants with standard neoprene seals. The study utilized a 1994 concrete pavement reconstruction project on WB I-94 near Hartford. The pavement was jointed reinforced with 8 meter joint spacing, standard joint widths, on an open-graded base. The field project resulted from a mutual agreement with material suppliers and the department to conduct the study. Material representatives were on site during construction. In 1992 the department had placed a moratorium on the use of silicone sealants for new or reconstructed concrete pavements because of consistently poor performance. The seals were rated visually over a five year period. Rating factors were sealant integrity, weathering, and debris intrusion.

Recommendations:

The report recommends that the silicone moratorium be made permanent as the pourable sealants experienced significant failure, while the neoprene seals had no failures.

Action:

The committee agrees with the recommendation. Because the decision affects policy on material usage, the recommendation will be forwarded to EOC for final acceptance. The committee also recommends a performance review of silicone use on re-sealing projects in the Preventive Maintenance Program is appropriate. Larry Galehouse will develop a brief problem statement for this study that outlines the need, deliverable, and past usage in the PM program. The problem statement will be submitted to the Engineer of Testing & Research for inclusion in the C&T Division’s research program.

Title - “Whitetopping Project on M-46 Between Carsonville and Port Sanilac”

MDOT Project Manager - Mike Eacker C&T

Abstract:

This report documents the construction aspects of a 1999 whitetopping project on M-46. Work Plan No.146, entitled “Evaluation of Concrete Rehabilitation Alternatives for Low-Volume Michigan Routes”, explains the background and design specifics for the project. M-46 is a relative low-volume, flexible pavement with typical surface distress characteristics. The performance of the whitetopping section is being compared over a 15 year period with several rehabilitation treatments utilizing bituminous mixtures.

Recommendations:

There were no major construction revisions. The concrete pavement thickness usually exceeded design estimates due to additional crown corrections. The fibers in the mixture slightly deterred the

ability to texture the surface. The report encourages additional whitetopping projects to be constructed to gain more experience to make a cost effectiveness comparison between concrete and bituminous treatments.

Action:

No specific action is required. The report only documented the construction aspects of the project. The committee agrees that other possible projects should be considered by the Regions.

Title - “Cost Effectiveness of European Demonstration Project: I-75 Detroit”

MDOT Project Manager - Dave Smiley C&T
Contract Principal Investigator - Michigan State University

Abstract:

This study reported on the final evaluation of a special concrete pavement demonstration project constructed in 1993 that compared European JPCP designs with standard Michigan JRCP designs. The European pavement section utilized structural designs typical of Germany with an exposed aggregate surface used in other European countries. Performance criteria consisted of condition data (distress and ride quality), surface friction, traffic/tire noise values, and deflection testing. The primary study objective was to do a cost effectiveness comparison of both pavement designs based on their relative performance to date. The cost analysis compared the future life cycle costs of each design, which included consideration of anticipated preventive maintenance actions.

Recommendations:

After seven years both designs are performing very well with no clear trends regarding condition data, which makes future maintenance predictions subject to change. The economic analysis showed that the capital cost of the European design could not exceed the cost of the Michigan control section by more than 17% to be equivalent in life cycle costs. Based on actual contract bid prices, the European pavement exceeded the Michigan control standard by 40% to 49%.

Action:

No specific action regarding implementation is required. The project indicates that Michigan standard designs are cost effective to construct. In addition, the excellent distress condition of the European pavement confirms that quality concrete mixtures together with prudent construction practices can reduce distress initiation. This supports the department’s efforts to continue pursuing these objectives.

DLS: C&T
9-29-00